# ENGS 490: Design Capstone I

**Fall 2025**

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**Prerequisites:** ENGS 200, 211 OR 220, two additional 200-level or above ENGS courses, OR program coordinator approval

**Course Materials:** None

**Course Overview:**  Building on principles and practice of engineering design and problem solving, this course will be centered on a hands-on development of a team-based design project. In the first semester, this course initiates the process through informed design solutions and lean startup activities.  At a quasi-professional level, the modeling, prototyping, and visual representations of their design serve as the final deliverable.

**Class Format:** ABET requires a major engineering design experience that 1) incorporates appropriate engineering standards and multiple constraints, and 2) is based on the knowledge and skills acquired in earlier course work. This course (and ENGS 491) are organized around a two-semester design project. As a team, you will identify a problem, propose a solution, and design a prototype in ENGS 490. In ENGS 491, you and your teammates will build a working prototype. You will be given some constraints and deadlines, but most day-to-day operations will be left to the students. You will need to organize yourselves and manage the project.

**Learning Outcomes:** In this capstone engineering design course, students can choose their projects from one of the engineering challenges in health, safety, various human or public facilities/conveniences, or environmental fields. Upon completion of this course, successful students will be able to

* Apply effective design strategies to develop a project in through brainstorming, collaboration in a team setting
* Analyze and assess specification requirements of system and subsystems, and alternatives
* Generate qualitative data to define value proposition of the project
* Apply measures of performance through quantitative data analysis, system characterization and design of quality tests
* Build a working model/low-mid fidelity prototype of their final product with a budget conscious approach that may include creative and innovative design solutions such as repurposing, recycling and/or reusing materials and technologies
* Implement project management skills, and communication skills through presentations, discussions, interaction with clients
* Develop an entrepreneurial mind set to come up with creative and innovative design solutions to make a pitch to their client base and customer segment

**Attendance:** Class attendance is a very important aspect of your success in this course. This class is organized around a team project. All team members must be available for team meetings. You are expected to attend every class and are accountable for missed content and assignments. I take attendance at the beginning of class. If you are late, it is your responsibility to make sure you are not marked absent. If you plan to miss a class, communicate with me and your teammates in advance. It is your responsibility to make up for the work that you missed.

**Expectation:**  You are expected to put in a minimum of 12 hours/week of work in order to successfully complete this course. Substantial work outside of class time will be required.

**Grading:** Grades for this course will be determined homework, in-class work, lab, and exams as shown below. Letter grades will be assigned using the scale below.

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| --- | --- | --- | --- |
| Points | Grade | Points | Grade |
| <60 | F | 77-79 | C+ |
| 60-62 | D- | 80-82 | B- |
| 63-66 | D | 83-86 | B |
| 67-69 | D+ | 87-89 | B+ |
| 70-72 | C- | 90-92 | A- |
| 73-76 | C | ≥93 | A |

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| --- | --- |
| Category | Proportion  |
| Instructor Assessment of Progress & Peer Evaluation | 20% |
| Preliminary Project Proposal – Report & Presentation | 30% |
| Final Project Proposal – Report & Presentation | 50% |

**Testing Policy:** This is a design project course. There are no tests.

**Preliminary Project Proposal (PPP):** This is the first of two major milestones for this project. As a team, you will identify ~3 high-level goals to define overall project success, criteria for success, a Gantt chart (<https://www.ganttproject.biz/>) outlining the timeline of the project, description of contingencies and the critical path to project completion, a detailed short-term task list (<https://trello.com/>), a rough long-term task list, and a preliminary research summary. You will submit a report and give a presentation. The proposal is due on September 30th.

**Final Project Proposal (FPP):** This is the second of two major milestones for this project. As a team, you will revise and update the PPP. Major updates will include extending the detailed task list through the end of the project and adding to the research summary. The FPP will also include a concept design for the prototype, description of design process (design criteria, decision matrices, engineering analysis, alternate design ideas, etc.), a materials list of items to order. Not all design decisions need to be made by this point in the project, but some of the major decisions should be made so they do not hold up the rest of the project (think about the critical path). The proposal is due on December 8th.

**Group Work and Grading:** The design project in this class is a team experience. Project success depends on working together as a team. The team will be most successful if all members are fully engaged and doing their share of the work. We (the faculty advisors) will make every effort to ensure grades reflect individual contributions to the team if the work is not shared equally, though separating individual effort from team success or failure is a challenge. There will be opportunities for peer evaluations and reflections. If you feel that your teammates are not contributing enough, discuss your concerns with the team and faculty advisors sooner rather than later.

**Academic Integrity:** You are expected to follow the integrity policy detailed in the handbook Academic Integrity at Roanoke College (<https://www.roanoke.edu/inside/a-z_index/academic_affairs/academic_integrity>). Additionally, if you are ever uncertain as to how the College’s policy pertains to any assignment, please ask us for clarification. Reports written for the design project should be written by team members.

**Plagiarism:** Representing another’s words, thoughts, or ideas as your own is plagiarism. Do not copy text from other sources and put it in your reports. Describe the content in your own words and cite the source. If you get an idea from a source (this should happen frequently), describe it in your own words and cite the source.

**Use of Generative AI:** Generative AI (e.g., ChatGPT) may be used in this class to assist you in the completion of tasks, if used responsibly. Do NOT use generative AI to write your report for you and do NOT rely on generative AI to provide you with factual information (it is often wrong). Generative AI may be useful for coming up with ideas, outlining a report, or revising a text. If you do use generative AI, state how you used it at the end of the document or assignment.

**Class and Team Disruption**: All students are entitled to a professional learning environment. Students should not act in a manner which will distract and disrupt the class learning experience. Such practices will not be tolerated. Students who are not productive, collaborative members of the team may be removed from the team and required to complete a project independently.